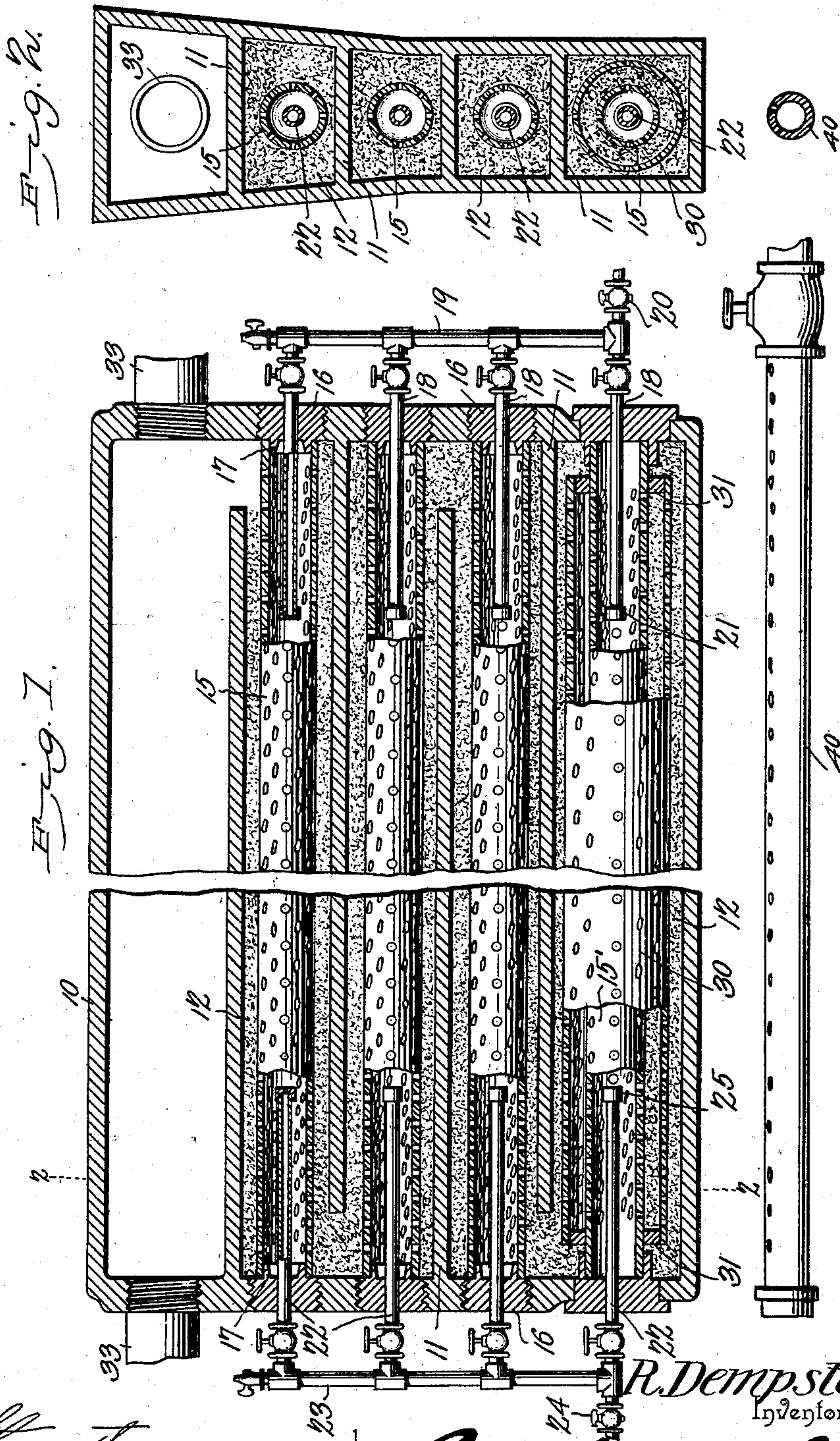


R. DEMPSTER.  
PROCESS OF MANUFACTURING GAS.

APPLICATION FILED FEB. 13, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



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No. 743,468.

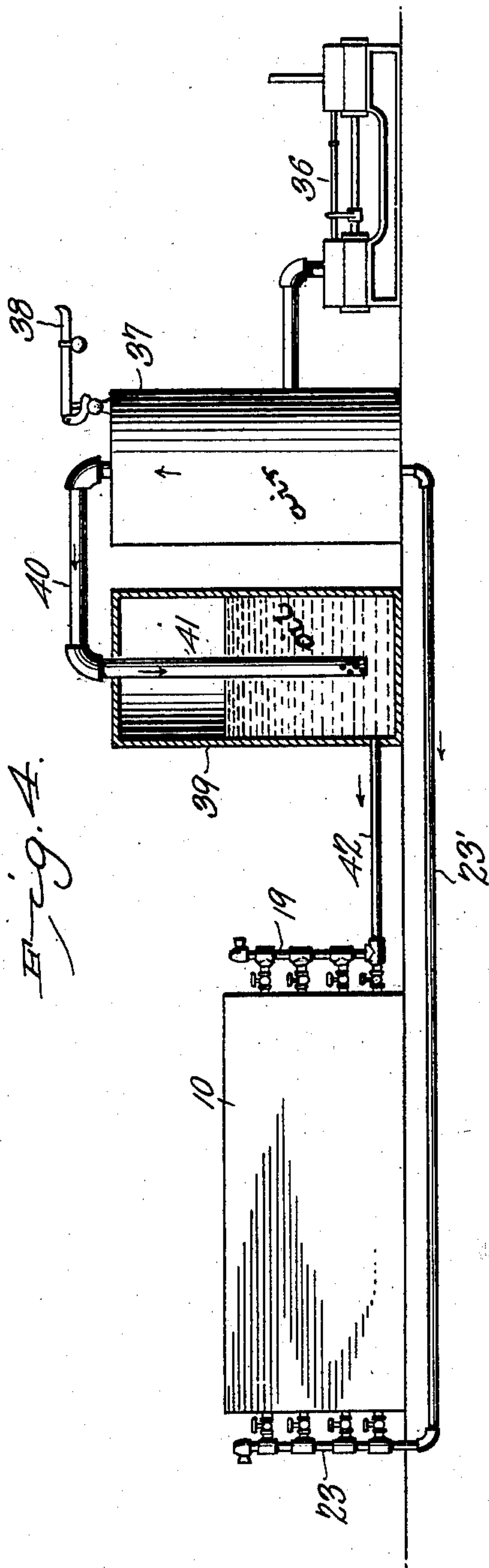
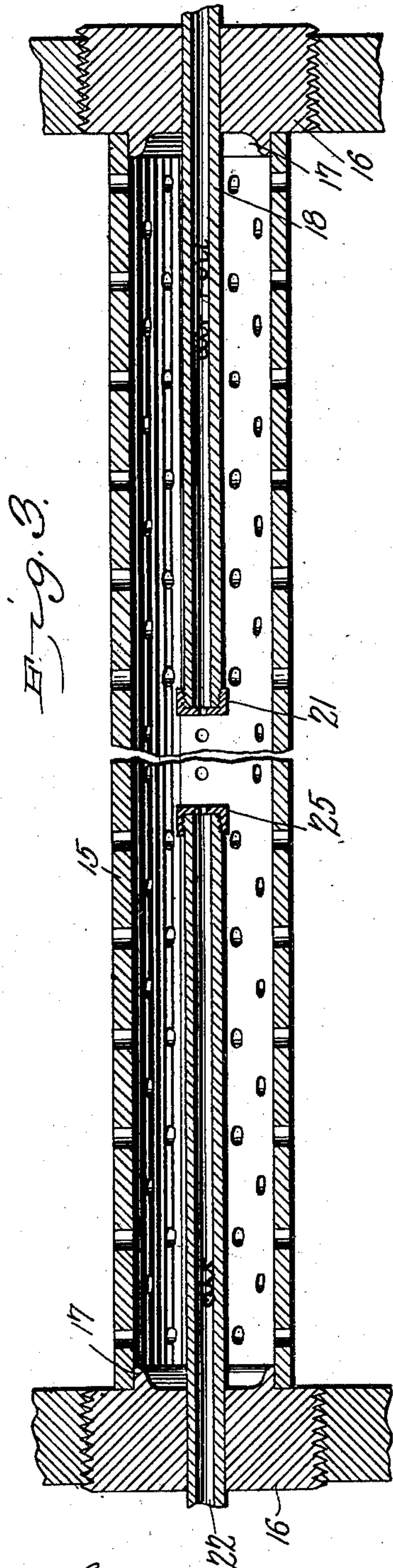
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## UNITED STATES PATENT OFFICE.

ROBERT DEMPSTER, OF MARIETTA, OHIO.

## PROCESS OF MANUFACTURING GAS.

SPECIFICATION forming part of Letters Patent No. 743,468, dated November 10, 1903.

Application filed February 13, 1903. Serial No. 143,249. (No specimens.)

*To all whom it may concern:*

Be it known that I, ROBERT DEMPSTER, a citizen of the United States, residing at Marietta, in the county of Washington and State of Ohio, have invented a new and useful Method of Manufacturing Gas, of which the following is a specification.

This invention relates to certain improvements in the manufacture of gas, and has for its principal object to effect the production of a fixed gas without the accumulation of by-products, such as tar, or the deposit of heavy carbonaceous residue, such as usually formed in retorts where the hydrocarbon employed in the production of the gas is heated and decomposed.

A further object of the invention is to effect the disintegration or breaking up of the body of hydrocarbon in order that it may assume the condition of a fine spray or mist within the retort and in this condition subjected to the action of heat in order to form a fixed gas, a suitable proportion of air being intermingled with the hydrocarbon to permit partial combustion within the retort and assist in the destruction of the heavier impurities.

A further object of the invention is to effect the production of gas from a mixture of hydrocarbon and a fluid under pressure, the hydrocarbon and fluid being injected into one end of a retort, a heated fluid under pressure being forced into the opposite end of said retort, the two bodies thus entering at opposite ends meeting at an intermediate point in the length of the retort and forming a spray or mist, which is immediately subjected to the action of heat.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of a retort suitable for carrying the improved process into effect. Fig. 2 is a transverse sectional elevation of the same on the line 2 2 of Fig. 1. Fig. 3 is a detail view, on an enlarged scale, of one of the retort-chambers. Fig. 4 is a view, partly in the nature of a diagram, illustrating an apparatus or plant for the production of gas from hydrocarbon and air.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

In the production of gas from liquid hy-

drocarbon in accordance with the methods in general use at the present time the hydrocarbon is introduced into a heated retort, generally in the form of a spray intermingled with a proportion of air or steam, or both, or in some cases the hydrocarbon in liquid form is forced under pressure into the retort and there decomposed. In these processes, so far as I am aware, there is always an accumulation of tar or other carbonaceous residue in the bottom of the retort which cannot be wholly eliminated by distillation and must be withdrawn through discharge-pipes provided for the purpose or the retorts must be periodically cleaned.

In carrying out the present invention I have found it possible to manufacture a fixed gas from crude oils without any previous refining operation and have successfully employed the heavier oils of asphalt base in the production of gas without the formation of tar or any by-product or residue whatsoever, it being possible to keep the retorts in continuous operation for an indeterminate period of time without drawing off any tarry or other matters and without any cleaning operations.

In carrying out the invention I employ a retort heated by a suitable burner or placed in a suitable furnace and there subjected to the action of heat, the retort being preferably heated to a cherry red, and into said retort I inject at one end air and at the other end a mixture of air and hydrocarbon to form a spray or mist, and while a single retort may be used it is preferred for the sake of economy to employ a number of superposed and connected retorts so arranged as to form practically a single retort-chamber.

The preferred construction is illustrated in Figs. 1 and 2, wherein 10 designates a metallic casing approximately rectangular in form and divided by a plurality of partitions into a number of superposed chambers. The partitions extend from side to side of the casing, but terminate short of one end thereof in order to form communicating spaces disposed alternately at opposite ends of the casing and providing a tortuous passage for the manufactured gas. Each of the chambers forms a separate retort, and these may be of slightly different construction, as



illustrated in Fig. 1. In the preferred form a perforated tube 15 is disposed centrally within each chamber, the ends of the tubes abutting against threaded plugs 16, fitted in threaded openings in the opposite ends of the casing and provided with suitable lugs or flanges 17 to assist in maintaining the tubes in position. The space around each of the tubes is filled with asbestos, which may be mixed with other suitable material to break up the oil and form an extensive heating-surface for contact with the molecules of hydrocarbon. Each of the plugs 16 is provided with a centrally-disposed opening for the passage of a pipe, each of the pipes 18 being connected to a pipe 19, through which air and oil are forced under pressure, a controlling-valve 20 being employed to govern the quantity of oil admitted to the retort. The inner end of the pipe 18 is provided with a perforated cap 21, through which the mixture of air and oil is forced in a fine jet or spray toward the central portion of the retort-chamber. Through the plug at the opposite end of the retort extends a pipe 22, connected to an air-supply pipe 23 and provided with a controlling-valve 24. The inner end of the pipe 22 is provided with a perforated cap 25, through which a jet of heated air is forced in the direction of the entering jet of air and oil. The entering jets meet at about the central portion of the retort-chamber, resulting in the formation of a heavy vapor or mist, the particles of hydrocarbon being very finely divided and in this condition subjected to the heat of the retort. Both the air and oil are forced in under pressure, and as the heating operation continues the volatile portions of the oil, together with a proportion of air, pass off through the perforations in the tubes 15 and are forced under pressure through the asbestos fiber, the asbestos being highly heated to transform the vapors into a fixed gas. The mechanical vaporizing action in the retorts is of such nature that no time is allowed for the heavier carbonaceous matter to fall to the bottom of the retort, and owing to the heating operation combustion will to some extent take place and prevent the accumulation of tarry deposits. The air and oil vapor or gas are forced out under pressure through the perforations in the tubes and pass through asbestos fiber, which serves not only as a heating agent, but also acts in a measure as a strainer or filter, which will retain any heavier particles of carbonaceous material and subject the same to the intense heat of the fiber, sufficient air passing over to consume the particles thus held, so that the retort is at all times free from tarry and other deposits.

In the lower portion of the casing, as illustrated in Figs. 1 and 2, is a slightly-modified form of retort comprising a perforated tube 15', extending, as before, from end to end of the retort and held in place by the end caps.

This tube is surrounded by a second perforated tube 30, held in position by annular rings 31, carried by the end portions of the tube 15'. The space between the two tubes is preferably packed with asbestos fiber, as well as the space around the outer tube 30.

The several chambers form a connected series of retorts, and from the upper chamber the manufactured gas may be conducted to a gasometer or to a point of consumption by means of a pipe or pipes 33.

In arranging a plant or system for carrying on the manufacture of gas the retort or retorts are placed within a suitable furnace, which may be heated by fluid fuel entering through a perforated supply-pipe 40 or by coal, the heating devices forming no part of the present invention.

Adjacent to the retort is an air-pump 36, operated by any suitable power, a gas-engine being preferably employed. The pump is connected to a compressed-air reservoir 37, which may be supplied with a suitable safety-valve 38. From the reservoir extends a pipe 23', which is connected to the manifold 23, the latter being connected to the several retort-pipes 22, through which air is admitted to the retorts. Adjacent to the compressed-air reservoir is an oil-tank 39, connected to the compressed-air reservoir by a pipe 40, which extends between the upper portions of both tanks, its discharge end extending downwardly within the oil-reservoir and terminating in a discharge-nozzle 41, through which a jet of air is forced into contact with the oil, or the discharge end of the air-pipe may be extended down to a point near the bottom of the tank and provided with a plurality of perforations to permit the escape of air under the oil-level. The oil-tank is connected by a pipe 42 to the manifold 19, which communicates with all of the retort-pipes 18.

It will be observed that the tubes 18 and 22 extend within the retorts for a considerable distance, so that the air and oil become heated before being discharged and are thus in a condition most favorable for uniting and forming a vapor. The initial heating process which takes place while the vapors are still in the retort is not in all cases sufficient to form a fixed gas; but it is found that by causing the vapor to travel a considerable distance through finely-divided material in a highly-heated condition each particle of the vapor will be subjected to the high temperature, and the result will be the fixed gas, which may be employed for illuminating, heating, power, and other purposes.

With an apparatus constructed in accordance with this invention it is possible to make a continuous run for an indeterminate period of time without stopping for cleaning purposes and without the removal of any tarry or other deposits, and crude oil of any character may be employed for the purpose of manufacturing the gas.



Having thus described the invention, what is claimed is—

1. The herein-described process of the manufacture of gas, said process consisting in forcing opposing jets of heated air and of previously-mingled air and oil into a heated retort to form a fine spray or mist, subjecting the mixture to the action of heat and forcing the same in the form of vapor through a mass of finely-divided heated material, the latter serving as a strainer and filter and arresting the heavier impurities to be subjected to an oxidizing process by a portion of the air forced into the retort.

2. The process of manufacturing fixed gas from crude petroleum, slush, distillate or fuel oil, which consists in forcing opposing jets of heated air and of previously-mingled air and oil into opposite ends of a heated retort through respective heated pipes to form a fine spray or mist, and subjecting the mingled oil and air to the action of heat and forcing the same in the form of a vapor through a mass of heated asbestos, the latter serving as a strainer and filter and arresting the heavier impurities to be subjected to an oxidizing

process by a portion of the heated air forced to the retort.

3. The herein-described process of manufacturing a fixed gas, said process consisting in maintaining at a high temperature a retort having a filling of finely-divided material, forcing opposing jets of air and of mingled air and oil into said retort, the feed-tubes extending for some distance beyond the ends of the retort and the entering material being subjected to the action of high heat before being injected into the retort, the meeting jets forming a fine spray or mist which turns into vapor under the influence of the heat, and the finely-divided material serving as a strainer and filter and arresting the heavier impurities to be subjected to an oxidizing process by a portion of the air entering the said retort.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ROBERT DEMPSTER.

Witnesses:

JNO. E. PARKER,

T. M. BLEAKLEY.